National Transportation Safety Board

Managing Fatigue to Enhance Safety: Lessons Learned from Transportation

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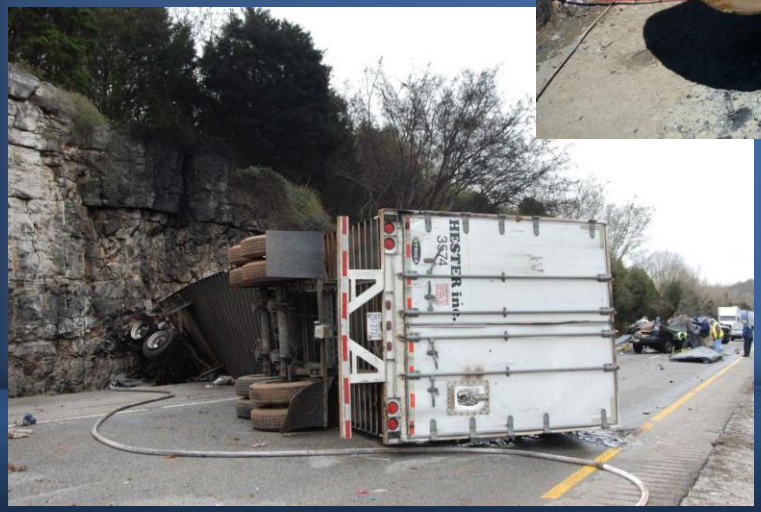
Board Member

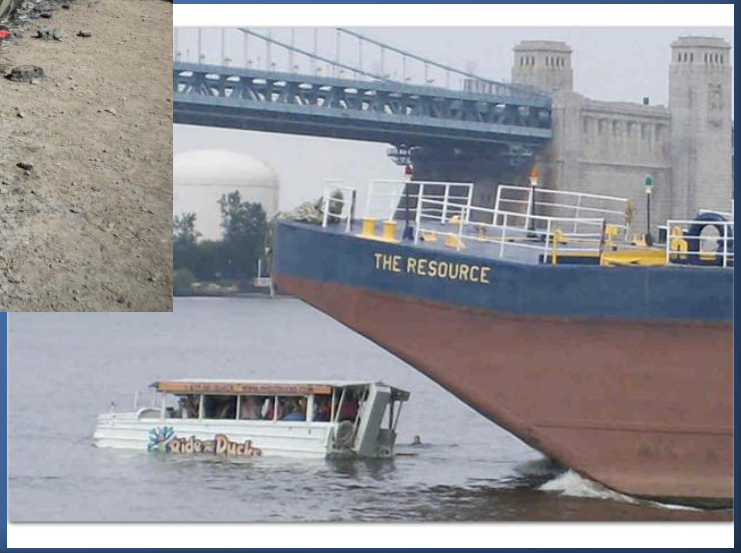
Halifax Health Grand Rounds
March 26, 2013

1) determining the probable cause of transportation accidents

2) making recommendations to prevent their recurrence

All Modes



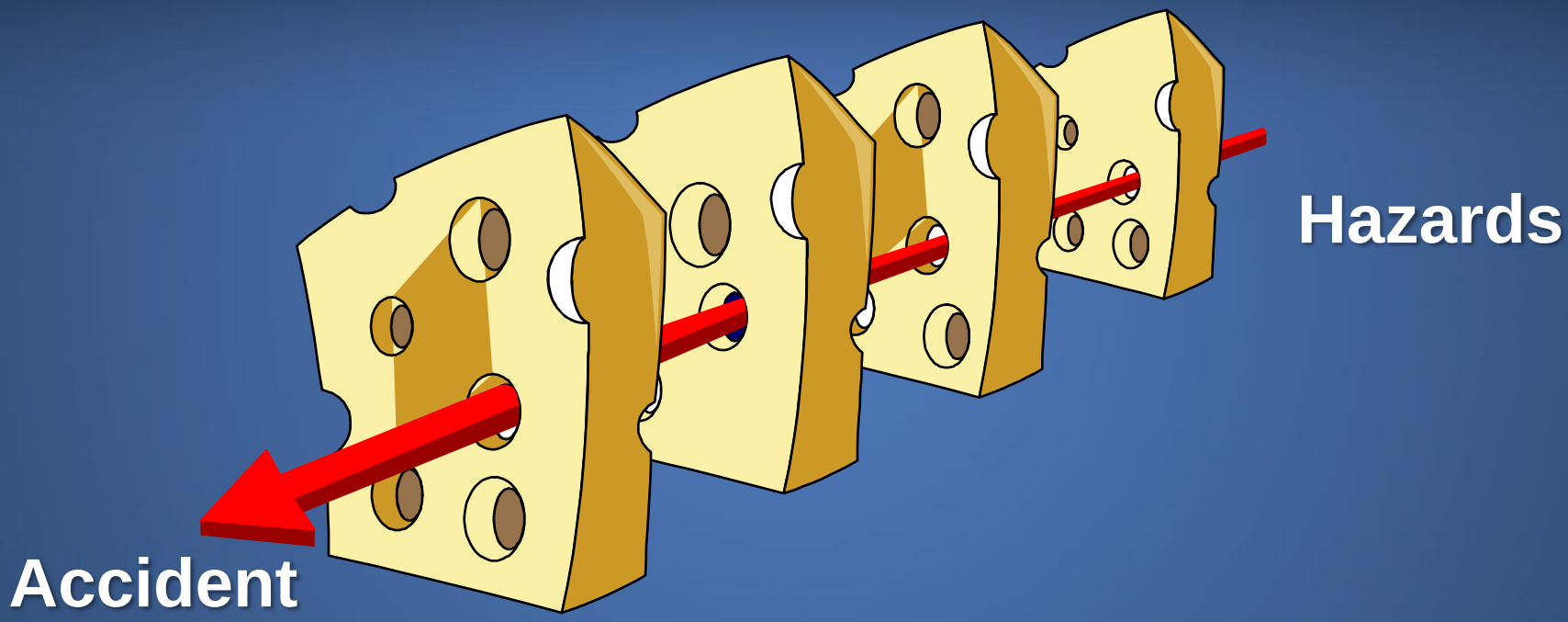


NTSB

Independent Federal Agency: Created in 1967

- ~ 132,000 accident investigations
- 13,500+ safety recommendations
- ~ 2,500 organizations/recipients
- 82% acceptance rate

“Swiss Cheese” Model (Reason)



Successive layers of defenses, barriers, and safeguards

NTSB Characterized as:

‘moral compass and industry conscience’

NTSB Chairman Deborah A.P. Hersman

Go! Flight 1002

- early starts, multiple segment days, sleep apnea

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Honorable John K. Lauber:

No Accident ≠
Safe Operation

Uncontrolled In-Flight Collision with Terrain
AIA Flight 808, Douglas DC-8-61, N814CK
U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

First NTSB aviation accident investigation
to cite fatigue as probable cause

- acute sleep loss, sleep debt, circadian disruption

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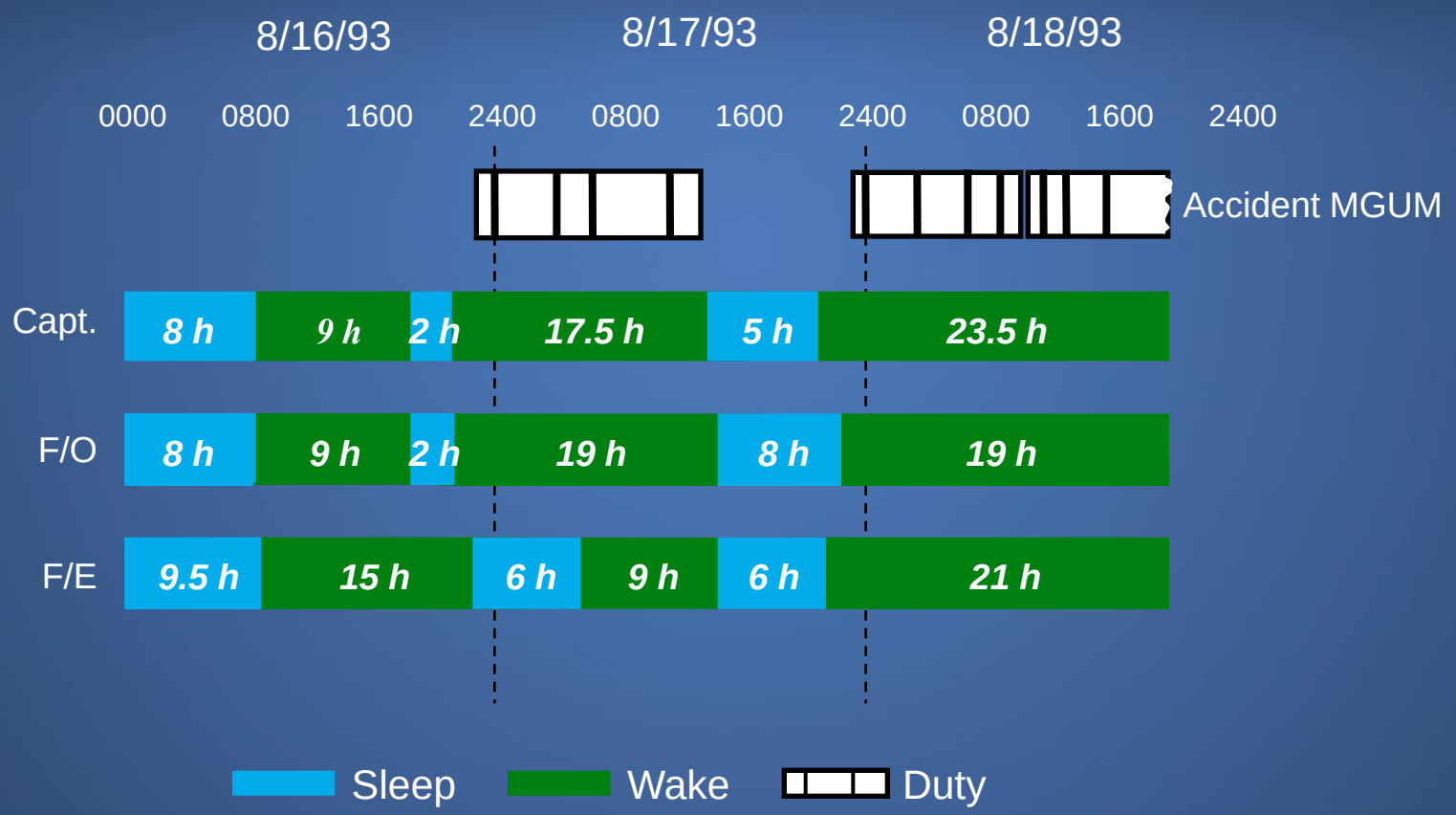
Crew Sleep History



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Observed Performance Effects

- Degraded decision-making
- Visual/cognitive fixation
- Poor communication/coordination
- Slowed reaction time

Uncontrolled In-Flight Collision with Terrain
AIA Flight 808, Douglas DC-8-61, N814CK
U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

"The National Transportation Safety Board determines that the probable causes of this accident were the impaired judgment, decision making, and flying abilities of the captain and flight crew due to the effects of fatigue…"

Miami, Oklahoma (June 26, 2009)
Fatigue Factors

- Off work for 3 weeks: day active/night sleep schedule
- 3am to 3pm shift work/drive schedule (since 1997)
- Early bedtime (2 hr phase advance in sleep time)
- Obtained min 3 hrs/max 5 hrs sleep prior to accident
- Subsequently diagnosed with mild sleep apnea


10 fatalities
3 serious injuries
2 minor injuries
5 no injuries
Ford
Windstar
Hyundai
Sonata
Kia
Spectra
Always
Save
Lowest Price...
Everyday
1874
481
Source: Oklahoma State Police

Probable Cause (fatigue)

"... driver's fatigue, caused by the combined effects of acute sleep loss, circadian disruption associated with his shift work schedule, and mild sleep apnea, which resulted in the driver's failure to react to slowing and stopped traffic ahead by applying the brakes or performing any evasive maneuver to avoid colliding with the traffic queue. . . ."

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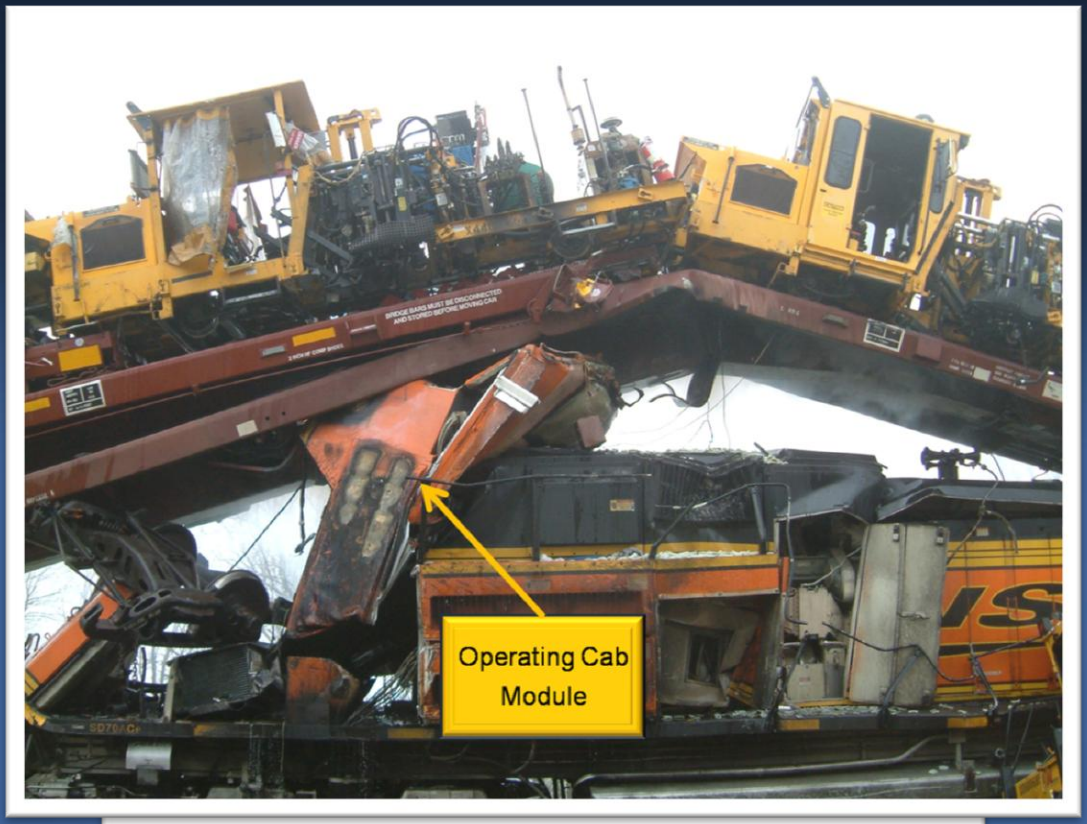
Track Path Animation

Collision Between Two BNSF Railway Freight Trains
Red Oak, Iowa
April 17, 2011
DCA11FR002



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Probable Cause (fatigue)

". . . failure of the crew of the striking train to comply with the signal indication requiring them to operate in accordance with restricted speed requirements and stop short of the standing train because they had fallen asleep due to fatigue resulting from their irregular work schedules and their medical conditions."

Challenges of a 24/7 Society

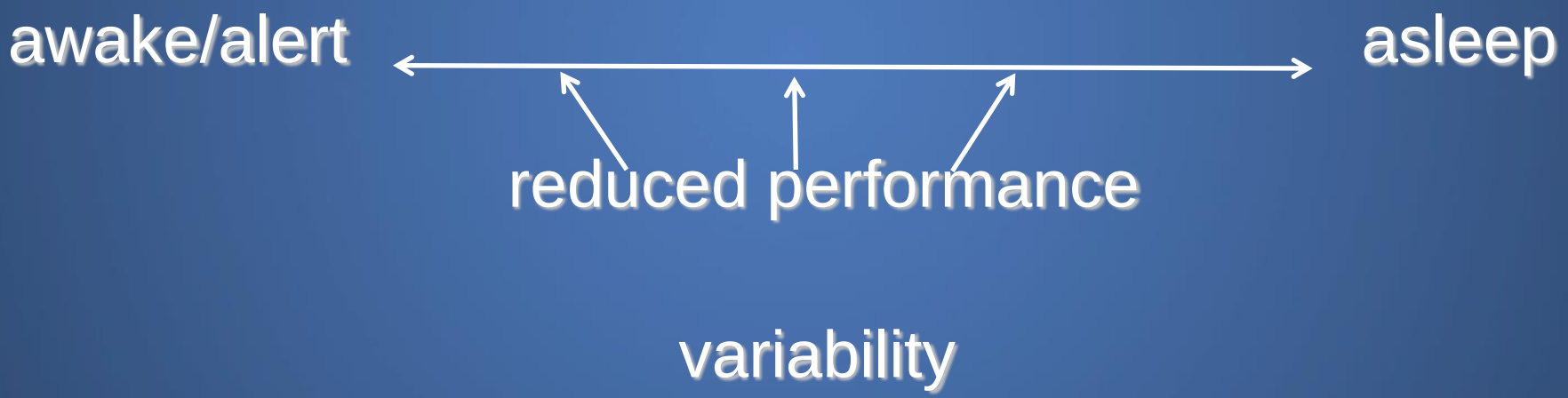
Fatigue Risks

Fatigue can degrade every aspect of human capability.

Four Fatigue Factors +

- Sleep loss
- Continuous hours of wakefulness
- Circadian/time of day
- Sleep disorders
- Other considerations

Fatigue Risks



Fatigue Risks

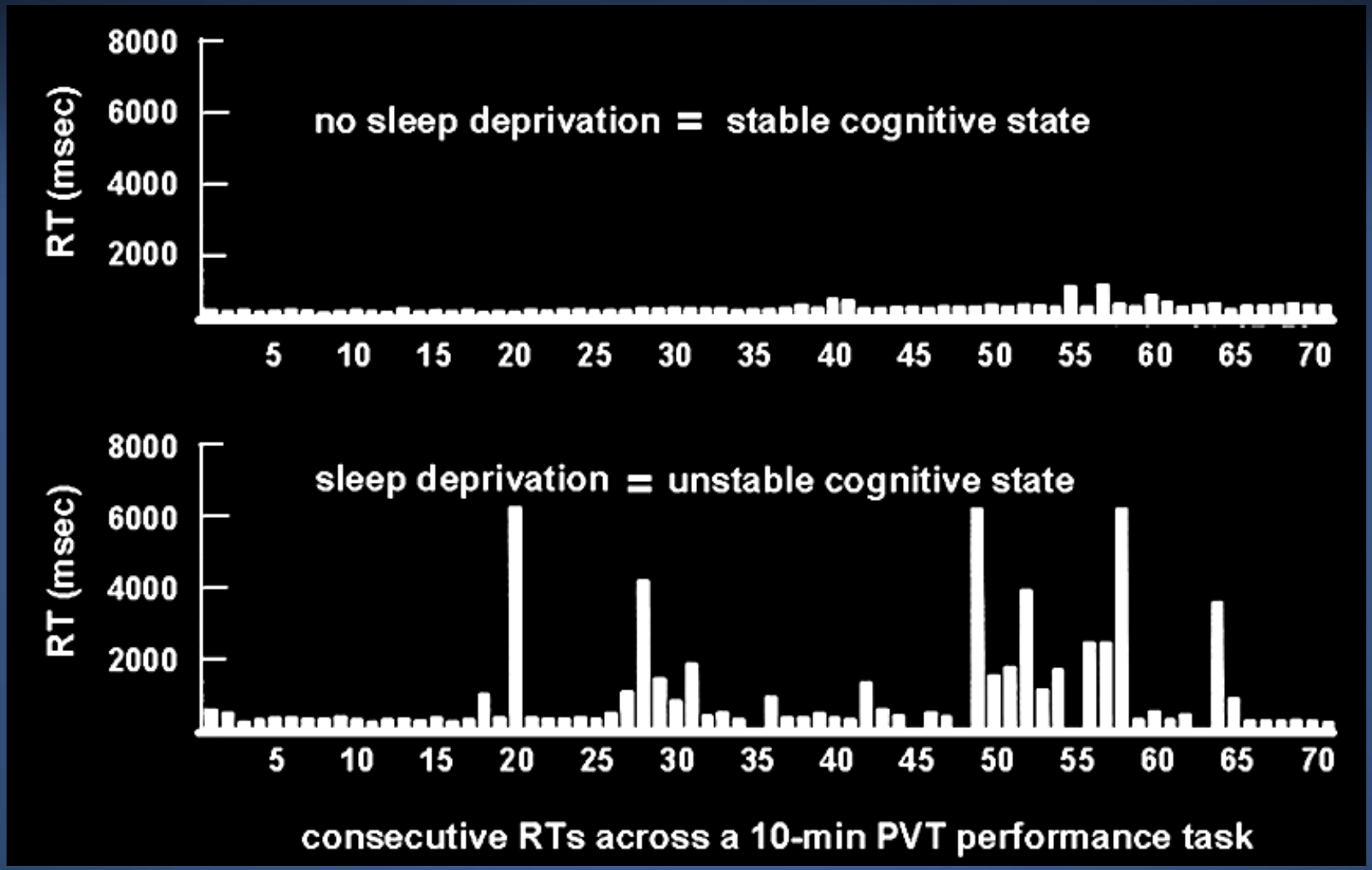
- degraded 20 – 50%+:

  - reaction time
  - memory
  - communication
  - situational awareness
  - judgment
  - attention
  - mood

- increased:

  - irritability
  - apathy
  - attentional lapses
  - microsleeps

Fatigue and Reaction Times



Doran SM, Van Dongen HP, Dinges DF. Sustained attention performance during sleep deprivation: evidence of state instability. *Archives of Italian Biology: Neuroscience* 2001;139:253-267.

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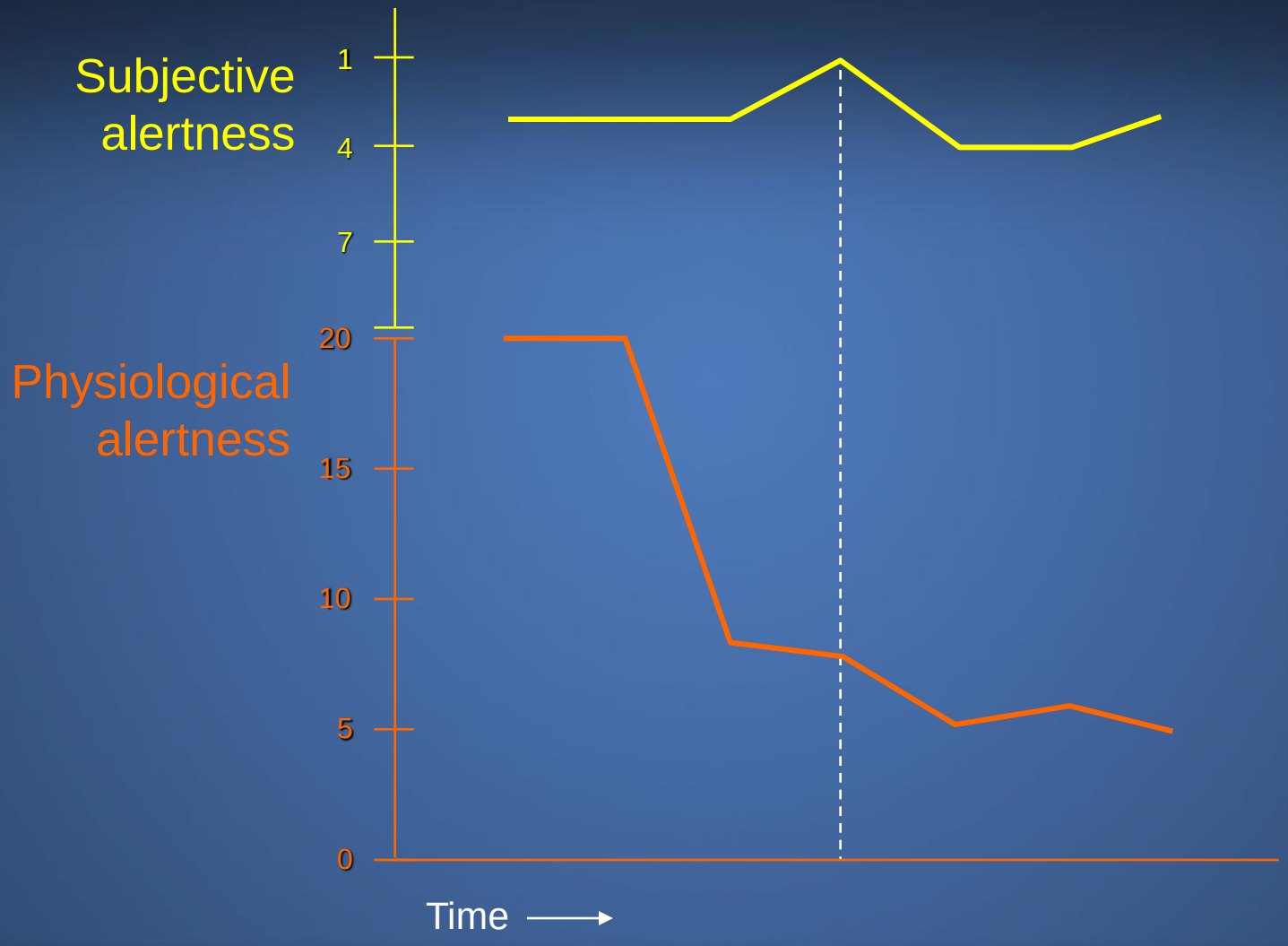
Alertness Reports Often Inaccurate



Adapted from Sasaki et al., 1986

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NTSB Safety Recommendations: Fatigue

- 40 years ago: May 10, 1972
- “Revise FAR 135 to provide adequate flight and duty time limitations.” (A-72-55)
- Classified “Closed-Unacceptable”

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Home > Transportation Safety > Most Wanted List

SHARE

MOST WANTED LIST

A program to increase the public's awareness of, and support for, action to adopt safety steps that can help prevent accidents and save lives.
The following are ten of the current issues.

Addressing Human Fatigue

General Aviation Safety

Safety Management Systems

Runway Safety

Bus Occupant Safety

Pilot & Air Traffic Controller Professionalism

Recorders

Teen Driver Safety

Addressing Alcohol-Impaired Driving

Motorcycle Safety

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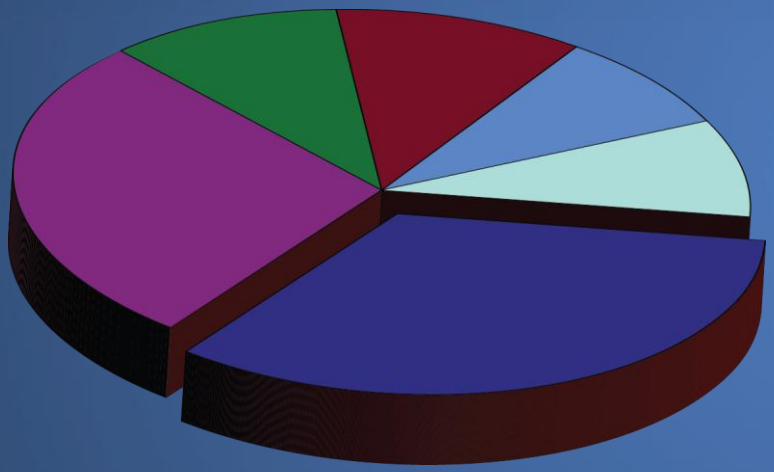
NTSB Recommendations

- MOST WANTED 1990 -2012
- ~200 fatigue recommendations

Complex Issue:



Requires Multiple Solutions

- Scheduling Policies and Practices
- Education/Awareness
- Organizational Strategies
- Healthy Sleep
- Vehicle and Environmental Strategies
- Research and Evaluation

Scheduling Policies and Practices

- Day sleep, night drive, ~ 4 am WOCL

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NTSB Fatigue Recommendations: Hours of Service / Scheduling

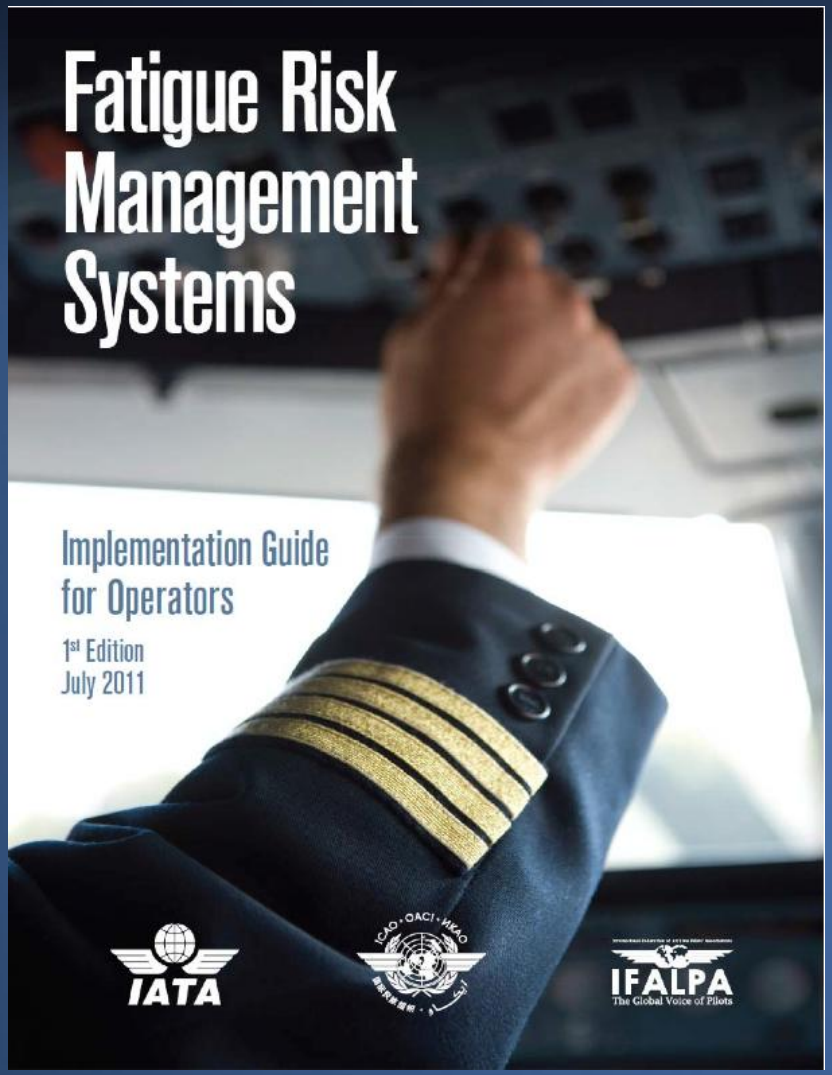
- Science-based hours of service
- Allow for at least 8 hours of uninterrupted sleep
- Fatigue mitigation strategies in the hours-of-service regulations for passenger-carrying drivers who operate during the nighttime window of circadian low
- Reduce schedule irregularity and unpredictability

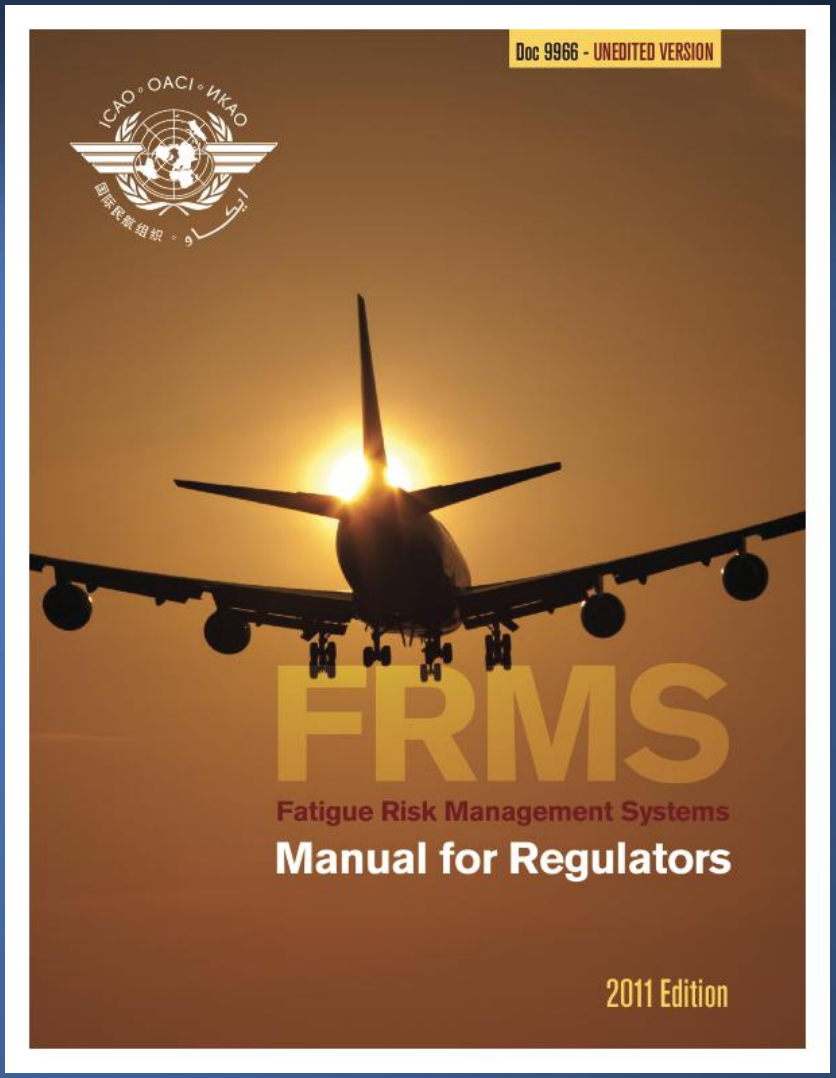
NTSB Fatigue Recommendations: Fatigue Management Systems

- Develop guidance based on empirical and scientific evidence for operators to establish fatigue management systems

- Establish an ongoing program to monitor, evaluate, report on, and continuously improve fatigue management programs implemented by motor carriers to identify, mitigate, and continuously reduce fatigue-related risks for drivers.

Examples


Fatigue Risk Management Systems
Implementation Guide for Operators
1st Edition
July 2011
IATA
ICAO • OACI • ИКАО
IFALPA
The Global Voice of Pilots


Doc 9966 - UNEDITED VERSION
ICAO • OACI • ИКАО
FRMS
Fatigue Risk Management Systems
Manual for Regulators
2011 Edition

NTSB Recommendations: Education/Strategies

- Develop a fatigue education and countermeasures training program
- Educate operators and schedulers
- Include information on use of strategies: naps, caffeine, etc.
- Review and update materials

Manage Fatigue = Enhance Safety

- Promote culture change
- Educate everyone
- Strong policies
- Acknowledge risks
- Take action!

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